Comments by Owen R. Cooper (TOAR Scientific Coordinator of the Community Special Issue) on:

Assessing the relative impacts of satellite ozone and its precursor observations to improve global tropospheric ozone analysis using multiple chemical reanalysis systems

Sekiya, T., Emili, E., Miyazaki, K., Inness, A., Qu, Z., Pierce, R. B., Jones, D., Worden, H., Cheng, W. Y. Y., Huijnen, V., and Koren, G.

EGUsphere [preprint], https://doi.org/10.5194/egusphere-2024-2426

Discussion started: 20 August 2024; Discussion closes 01 Oct., 2024

This review is by Owen Cooper, TOAR Scientific Coordinator of the TOAR-II Community Special Issue. I, or a member of the TOAR-II Steering Committee, will post comments on all papers submitted to the TOAR-II Community Special Issue, which is an inter-journal special issue accommodating submissions to six Copernicus journals: ACP (lead journal), AMT, GMD, ESSD, ASCMO and BG. The primary purpose of these reviews is to identify any discrepancies across the TOAR-II submissions, and to allow the author teams time to address the discrepancies. Additional comments may be included with the reviews. While O. Cooper and members of the TOAR-II Steering Committee may post open comments on papers submitted to the TOAR-II Community Special Issue, they are not involved with the decision to accept or reject a paper for publication, which is entirely handled by the journal's editorial team.

General Comments:

TOAR-II has produced two guidance documents to help authors develop their manuscripts so that results can be consistently compared across the wide range of studies that will be written for the TOAR-II Community Special Issue. Both guidance documents can be found on the TOAR-II webpage: https://igacproject.org/activities/TOAR/TOAR-II

The TOAR-II Community Special Issue Guidelines: In the spirit of collaboration and to allow TOAR-II findings to be directly comparable across publications, the TOAR-II Steering Committee has issued this set of guidelines regarding style, units, plotting scales, regional and tropospheric column comparisons, tropopause definitions and best statistical practices.

Guidance note on best statistical practices for TOAR analyses: The aim of this guidance note is to provide recommendations on best statistical practices and to ensure consistent communication of statistical analysis and associated uncertainty across TOAR publications. The scope includes approaches for reporting trends, a discussion of strengths and weaknesses of commonly used techniques, and calibrated language for the communication of uncertainty. Table 3 of the TOAR-II statistical guidelines provides calibrated language for describing trends and uncertainty, similar to the approach of IPCC, which allows trends to be discussed without having to use the problematic expression, "statistically significant".

Specific Comments:

Line 220
It's not clear which TOAR surface ozone product was used. Are you using the pre-complied 2x2 degree gridded product, available from the PANGAEA repository? If so the PANGAEA citation needs to be provided, as follows:
Schultz, Martin G; et al. (2017): Tropospheric Ozone Assessment Report, links to Global surface ozone datasets [dataset publication series]. PANGAEA, https://doi.org/10.1594/PANGAEA.876108, Supplement to: Schultz, MG et al. (2017): Tropospheric Ozone Assessment Report: Database and Metrics Data of

Global Surface Ozone Observations. Elementa - Science of the Anthropocene, 5:58, 26 pp, https://doi.org/10.1525/elementa.244

The model/reanalysis evaluation is conducted across the full year of 2010. As reported by Logan (1999), ozonesondes show strong seasonal cycles of ozone in all latitude bands, with mid-tropospheric ozone at northern mid-latitudes increasing by more than 50% from winter to summer. Was there any seasonal dependence regarding the improvement achieved by assimilating satellite data?

The model output and the reanalysis were evaluated against ozonesondes using all observations collected in broad latitude bands, rather than comparing models and observations at individual monitoring sites. Can you comment on why this approach was chosen? I assume it's because you need a large sample size, due to the fact that most individual monitoring sites only sample the atmosphere once per week, which fails to provide accurate monthly means, as reported by Logan (1999). A new paper published in the TOAR-II Community Special Issue discusses the challenges of detecting long-term ozone trends based on once-per-week sampling and their Figure 1 shows the errors associated with trying to characterize monthly mean ozone with just 4 profiles per month (Chang et al., 2024).

Minor Comments:

Figures 1, 2 and 3 are very hard to read because the panels are so small. The panels could be made larger if they were arranged vertically, in 3 columns; also, the color bars can only be shown once, instead of repeating for each panel. Similarly, Figure 5 is hard to read because the panels are too small. The lat/lon numbers can be removed and the color bars can only be shown once.

line 25
aircrafts should be aircraft, which can be either plural or singular

line58
please explain the perfect model assumption

Line 217
(30°N–30°N) should be (30°S–30°N)

References:

Chang, K.-L., Cooper, O. R., Gaudel, A., Petropavlovskikh, I., Effertz, P., Morris, G., and McDonald, B. C. (2024), Technical note: Challenges in detecting free tropospheric ozone trends in a sparsely sampled environment, Atmos. Chem. Phys., 24, 6197–6218, https://doi.org/10.5194/acp-24-6197-2024

Logan, J.A., 1999. An analysis of ozonesonde data for the troposphere: Recommendations for testing 3-D models and development of a gridded climatology for tropospheric ozone. Journal of Geophysical Research: Atmospheres, 104(D13), pp.16115-16149.